National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 728

Intermediate-Purity Zinc

This Standard Reference Material (SRM) is intended primarily for the calibration of instruments and the evaluation of chemical methods used in the analysis of zinc materials. This SRM provides a homogeneous, well-characterized material for the analysis of pure zinc and zinc alloys, and is especially useful where chemical methods are employed. One unit of SRM 728 consists of 450 g of material in the form of pellets approximately 3 mm in diameter (0.125 in).

Certified Values and Uncertainties: The certified values for five elements are listed in Table 1. All concentration values are expressed as mass fractions [1]. The uncertainties given in Table 1 are intended to approximate a 95 % level of confidence. **Note:** for this certificate revision the iron value and all information values have been reestablished. For iron, the uncertainty is stated as the expanded uncertainty, $U = ku_c$, where u_c denotes the combined standard uncertainty for the isotope dilution thermal ionization mass spectrometry analysis. For cadmium, copper, lead, and silver, the uncertainties are calculated as $U + B$. In this expression, U denotes the expanded uncertainty, $U = ku_c$, where u_c is the combined standard uncertainty for the two analytical methods, and k is the expansion factor obtained from a table of the t-distribution corresponding to the 95 % level of confidence. The quantity B is an allowance for between-method bias, and is equal to the differences between the certified value and the mean value for the analytical method that differs most from the certified value.

Noncertified Values: Noncertified values for two elements are listed in Table 2 as these values may have sources of bias yet to be investigated. Uncertainties were not determined when this work was done. Therefore, only ranges of the analytical data are given. The ranges of values reported are the extreme variations of the individual results reported by the methods of analysis used.

Information Values: Information values for 29 elements are given in Table 3.

The methods used for the determination of all the elements on this certificate are listed in Table 4.

This SRM was prepared from a special lot of high grade electrolytic zinc by Cominco American, Inc. Pellets were formed by melting a portion of the lot and pouring the molten metal into distilled water.

The original analytical measurements were performed by R. Alvarez, D.A. Becker, E.R. Deardorff, E.J. Maienthal, P.J. Paulsen, and B.A. Thompson of the NIST Analytical Chemisty Division, Redetermination of the iron content of this SRM was performed by E.S. Beary and J.D. Fassett of the NIST Analytical Chemistry Division. Information values were supplied by Shiva Technologies, Inc., Cicero, NY and Elemental Research Inc., North Vancouver, British Columbia, Canada.

The original technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.L. Hague. The revision of this certificate was coordinated through the Standard Reference Materials Program by C.M. Beck II.

Gaithersburg, MD 20899
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Thomas E. Gills, Chief
Standard Reference Materials Program

NOTICE TO USERS

Before use, remove pellet surface contamination by placing the pellets in dilute high purity nitric acid for about 1 min, and then rinsing them thoroughly with distilled water.

Table 1. Certified Mass Fractions

Element	(in mg/kg)
Cadmium	1.14 ± 0.04
Copper	5.68 ± 0.34
Iron	1.84 ± 0.12
Lead	11.13 ± 0.45
Silver	1.08 ± 0.33

Table 2. Noncertified Mass Fractions

Element	(in mg/kg)	Range of Values Reported (in mg/kg)
Thallium	0.2	0.15 - 0.17
Tin	0.02	0.013 - 0.032

Table 3. Information Mass Fractions

Element	(in mg/kg)	Element	(in mg/kg)
Aluminum	0.07	Nickel	0.45
Antimony	0.5	Niobium	<0.01
Arsenic	<0.005	Palladium	<0.05
Bismuth	<0.005	Platinum	<0.01
Calcium	0.02	Potassium	<0.01
Chromium	<0.03	Rhodium	<0.05
Cobalt	1.0	Ruthenium	<0.01
Gallium	<0.05	Scandium	<0.001
Gold	<0.02	Silicon	<0.01
Indium	<0.005	Sodium	0.01
Iridium	<0.005	Titanium	0.04
Magnesium	<0.001	Tungsten	0.4
Manganese	0.07	Vanadium	<0.001
Mercury	<0.05	Zirconium	<0.01
Molybdenum	<0.01		

Table 4. Methods Used for the Analysis of SRM 728

Element	Methods	Element	Methods
Aluminum	GDMS, ICPMS	Molybdenum	GDMS, ICPMS
Antimony	GDMS, ICPMS	Nickel	GDMS, ICPMS
Arsenic	GDMS, ICPMS	Niobium	GDMS, ICPMS
Bismuth	GDMS, ICPMS	Palladium	GDMS, ICPMS
Cadmium	ID-SSMS, POLAR	Platinum	GDMS, ICPMS
Calcium	GDMS, ICPMS	Potassium	GDMS, ICPMS
Chromium	GDMS, ICPMS	Rhodium	GDMS, ICPMS
Cobalt	GDMS, ICPMS	Ruthenium	GDMS, ICPMS
Copper	ID-SSMS, POLAR	Scandium	GDMS, ICPMS
Gallium	GDMS, ICPMS	Silicon	GDMS, ICPMS
Gold	GDMS, ICPMS	Silver	ID-SSMS, INAA
Indium	GDMS, ICPMS	Sodium	GDMS, ICPMS
Iridium	GDMS, ICPMS	Thallium	ID-SSMS
Iron	ID-TIMS	Tin	ID-SSMS
Lead	ID-SSMS, POLAR	Titanium	GDMS, ICPMS
Magnesium	GDMS, ICPMS	Tungsten	GDMS, ICPMS
Manganese	GDMS, ICPMS	Vanadium	GDMS, ICPMS
Mercury	GDMS, ICPMS	Zirconium	GDMS, ICPMS

Methods

GDMS	Glow Discharge Mass Spectrometry
ICPMS	Inductively Coupled Plasma Mass Spectrometry
ID-SSMS	Isotope Dilution Spark Source Mass Spectrometry
ID-TIMS	Isotope Dilution Thermal Ionization Mass Spectrometry
INAA	Instrumental Neutron Activation Analysis
POLAR	Polarography

REFERENCES

[1] Taylor, B.N., "Guide for the Use of the International System of Units (SI)," NIST Special Publication 811, 1995 Ed., (April 1995).

[2] Schiller, S.B. and Eberhardt, K.R., "Combining Data from Independent Chemical Analysis Methods," Spectrochimica Acta, **46B,** (12), pp. 1607-1613, (1991).

[3] *Guide to the Expression of Uncertainty in Measurement*, ISBN 92-67-10188-9 1st Ed. ISO, Geneva, Switzerland, (1993).